Election of Species

Applicants are required to elect a single species for prosecution on the merits. Accordingly, Applicants elect the following species set forth in Group I:

(1) in category A (recognition moiety), carboxylic acid;

(2) in category B (analyte), inorganic ions; and

(3) in category C (interaction type), ionic bonding.

Because Applicants have elected Group I, no election is necessary with respect to category D at this time. The election of carboxylic acid in category A is readable upon claims 66, 76, 81, and 114. The election of inorganic ions in category B is readable upon claims 66, 69, 76-80, and 114. The election of interaction type in category C is readable upon claims 66, 68, and 114.

CONCLUSION

In view of the foregoing, Applicants believe all claims now pending in this Application are in condition for allowance. The issuance of a formal Notice of Allowance at an early date is respectfully requested.

If the Examiner believes a telephone conference would expedite prosecution of this application, please telephone the undersigned at 415-576-0200.

Respectfully submitted,

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APPENDIX A: VERSION WITH MARKINGS TO SHOW CHANGES MADE

114. A device for detecting ionic bonding between an inorganic ion and a carboxylic acid, said device comprising:

a first substrate having a surface;

a second substrate having a surface, said first substrate and said second substrate being aligned such that said surface of said first substrate opposes said surface of said second substrate;

a first organic layer attached to said surface of said first substrate, said organic layer comprises said carboxylic acid which interacts with said inorganic ion;

a mesogenic layer between said first substrate and said second substrate, said mesogenic layer comprising a plurality of mesogens, wherein at least a portion of said plurality of mesogens undergo a detectable switch in orientation upon ionic bonding between said carboxylic acid and said inorganic ion, whereby said presence of said inorganic ion is detected.

115. The device of claim 114, wherein said first surface and said second surface comprise a layer of gold.

116. The device of claim 115, wherein said organic layer is 11-mercaptoundecanoic acid.

117. The device of claim 116, wherein said mesogenic layer is 4-cyano-4-pentylbiphenyl.

APPENDIX B: CLAIMS PENDING

66. A device for detecting an interaction between an analyte and a recognition moiety, said device comprising:

a first substrate having a surface;

a second substrate having a surface, said first substrate and said second substrate being aligned such that said surface of said first substrate opposes said surface of said second substrate;

a first organic layer attached to said surface of said first substrate, wherein said organic layer comprises a first recognition moiety which interacts with said analyte; and

a mesogenic layer between said first substrate and said second substrate, said mesogenic layer comprising a plurality of mesogens, wherein at least a portion of said plurality of mesogens undergo a detectable switch in orientation upon interaction between said first recognition moiety and said analyte, whereby said presence of said analyte is detected.

67. The device according to claim 66, wherein said analyte is a member selected from the group consisting of acids, bases, organic ions, inorganic ions, pharmaceuticals, herbicides, pesticides, chemical warfare agents, noxious gases, biomolecules and combinations thereof.

68. The device according to claim 66, wherein said interaction is a member selected from the group consisting of covalent bonding, ionic bonding, hydrogen bonding, van der Waals interactions, repulsive electronic interactions, attractive electronic interactions, hydrophobic interactions, hydrophilic interactions and combinations thereof.

69. The device according to claim 67, wherein said interaction is an ionic interaction and the analyte is a member selected from the group consisting of acids, bases, metal ions and metal ion binding ligands.

70. (Amended) The device according to claim 67, wherein said analyte is a nucleic acid and said interaction is a hydrogen bonding interaction between said nucleic acid and a nucleic acid strand having an at least partially complementary sequence.

71. (Amended) The device according to claim 67, wherein said interaction is between a protein and a small molecule.

72. The device according to claim 71, wherein said interaction is between an enzyme and a substrate for said enzyme.

73. The device according to claim 71, wherein said interaction is between an antibody and a complementary antigen.

74. The device according to claim 71, wherein said interaction is between biotin and avidin.

75. The device according to claim 71, wherein said interaction is between biotin and an antibiotin antibody.

76. A method for detecting an analyte, comprising:

contacting with said analyte a recognition moiety for said analyte, wherein said contacting causes at least a portion of a plurality of mesogens proximate to said recognition moiety to detectably switch from a first orientation to a second orientation upon contacting said analyte with said recognition moiety; and

detecting said second orientation of said at least a portion of said plurality of mesogens, whereby said analyte is detected.

77. The method according to claim 76, wherein said analyte is a member selected from the group consisting of vapors, gases and liquids.

78. The method according to claim 77, wherein said vapor is a member selected from the group consisting of vapors of a single compound and vapors of a mixture of compounds.

79. The method of claim 77, wherein said gas is a member selected from the group consisting of a single gaseous compound and mixtures of gaseous compounds.

80. The method of claim 77, wherein said liquid is a member selected from the group consisting of a single liquid compound, mixtures of liquid compounds, solutions of solid compounds and solutions of gaseous compounds.

81. The method according to claim 76, wherein said recognition moiety comprises a member selected from the group consisting of metal ions, metal-binding ligands, metal-ligand complexes, nucleic acids, peptides, cyclodextrins, acids, bases, antibodies, enzymes and combinations thereof.

82. The method according to claim 76, wherein from about 10 to about 108 mesogens undergo said switching for each molecule of analyte interacting with said analyte.

83. The method according to claim 76, wherein from about 103 to about 106 mesogens undergo said switching.

84. The method according to claim 76, wherein said first orientation is a member selected from the group consisting of uniform, twisted, isotropic and nematic and said second orientation is a member selected from the group consisting of uniform, twisted, isotropic and nematic, with the proviso that said first orientation and said second orientation are different orientations.

85. The method according to claim 84, wherein said detecting is achieved by a method selected from the group consisting of visual observation, microscopy, spectrometry, electronic techniques and combinations thereof.

86. The method according to claim 84, wherein said visual observation detects a change in reflectance, transmission, absorbance, dispersion, diffraction, polarization and combinations thereof, of light impinging on said plurality of mesogens.

87. The method according to claim 85, wherein said microscopy is a member selected from the group consisting of light microscopy, polarized light microscopy, atomic force microscopy, scanning tunneling microscopy and combinations thereof.

88. The method according to claim 85, wherein said spectroscopic technique is a member selected from the group consisting of infrared spectroscopy, raman spectroscopy, x-ray spectroscopy, visible light spectroscopy, ultraviolet spectroscopy and combinations thereof.

89. The method according to claim 85, wherein said electronic technique is a member selected from the group consisting of surface plasmon resonance, ellipsometry, impedometric methods and combinations thereof.

109. A device comprising:

a first substrate having a surface;

a second substrate having a surface, said first substrate and said second substrate being aligned such that said surface of said first substrate opposes said surface of said second substrate;

a first organic layer attached to said surface of said first substrate, wherein said first organic layer comprises a first recognition moiety interacting with an analyte; and

a mesogenic layer between said first substrate and said second substrate, said mesogenic layer comprising a plurality of mesogenic compounds.

110. The device according to claim 109, further comprising an opening allowing communication between said interior portion of said device and an analyte access to said recognition moiety.

111. The device according to claim 109, wherein said organic layer is a rubbed polymer.

112. The device according to claim 111, wherein said rubbed polymer is a biopolymer.

113. The device according to claim 112, wherein said biopolymer is a member selected from the group consisting of proteins, polysaccharides and combinations thereof.

114. A device for detecting ionic bonding between an inorganic ion and a carboxylic acid, said device comprising:

a first substrate having a surface;

a second substrate having a surface, said first substrate and said second substrate being aligned such that said surface of said first substrate opposes said surface of said second substrate;

a first organic layer attached to said surface of said first substrate, said organic layer comprises said carboxylic acid which interacts with said inorganic ion;

a mesogenic layer between said first substrate and said second substrate, said mesogenic layer comprising a plurality of mesogens, wherein at least a portion of said plurality of mesogens undergo a detectable switch in orientation upon ionic bonding between said carboxylic acid and said inorganic ion, whereby said presence of said inorganic ion is detected.

115. The device of claim 114, wherein said first surface and said second surface comprise a layer of gold.

116. The device of claim 115, wherein said first organic layer is 11-mercaptoundecanoic acid.

117. The device of claim 116, wherein said mesogenic layer is 4-cyano-4-pentylbiphenyl.